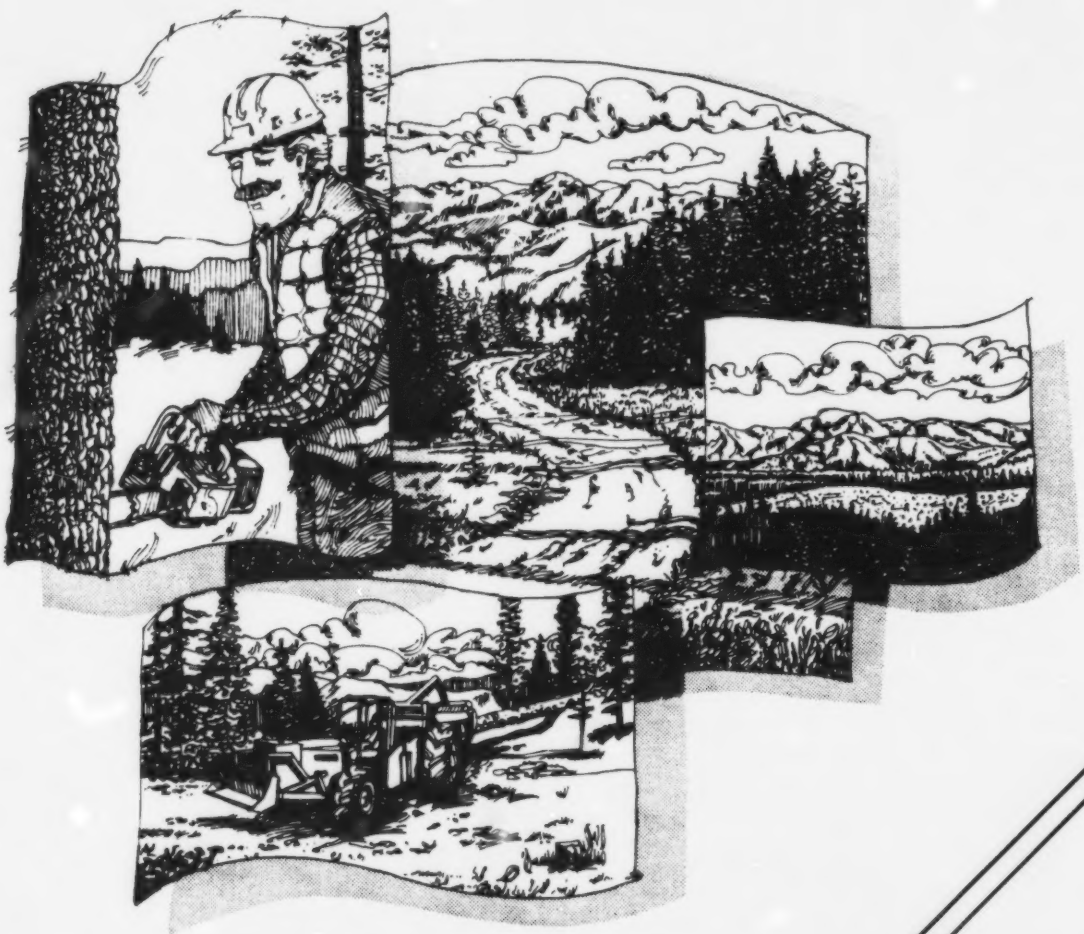
Alberta Timber Harvest Planning and Operating Ground Rules



Alberta

FORESTRY,
LANDS AND WILDLIFE
Forest Service

ALBERTA

TIMBER HARVEST PLANNING

AND

OPERATING GROUND RULES

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1. INTRODUCTION

1.1 Ground Rule Development and Use

These ground rules have been developed to provide direction to the forest industry and Forest Service staff in planning, conducting and monitoring harvesting operations in Alberta.

The ground rules have been designed to provide sufficient flexibility to accommodate variations in specific areas, but in general, they will apply to all timber licence and commercial timber permit operations. Any deviation from these ground rules will be specifically stated in the individual timber disposition or in the approved Annual Operating Plan.

These ground rules shall be informally reviewed with members of the Alberta Forest Products Association Technical Committee in the spring of 1988 to assess progress of implementation and to identify concerns if any.

Formal reviews shall normally be carried out every five years unless earlier review is warranted by significant changes in logging technology or wood utilization.

2. APPLICATION OF THE GROUND RULES

These ground rules outline the objectives and standards that are expected to be met during harvest planning and operations on timber licences and permits. They are intended to be applied with sound judgement, practical experience and technical competence. It is recognized there will be exceptions or unusual conditions to which these standards cannot be strictly applied. In keeping with sound forest management practices, reasonable adjustments best suited to the requirements of each specific situation are expected to be used.

Designated Forest Officers have the authority to waive or amend the application of these ground rules in any single specific instance, provided it is done in writing, except when another Forest Service authority has the jurisdiction. Any amendment must be consistent with the conditions of the disposition, the Forests Act and Regulations thereto, and all other Provincial statutes.

It is expected that these standards will be adhered to unless stated otherwise in a specific disposition, an approved operating plan, or as amended at the discretion of the Forest Superintendent.

3. ANNUAL OPERATING PLAN DEVELOPMENT AND SUBMISSION REQUIREMENTS

1. An Annual Operating Plan (AOP), prepared in accordance with these ground rules, shall be approved before any operations may be conducted on a timber licence or permit.

   Harvesting may commence only after the A.O.P. is approved for logging either as a whole or on a block-by-block basis. Operations shall be conducted progressively and the number of blocks open at any one time will be in accordance with the approved A.O.P.

   It should be noted that a cutblock will be considered open until it has received clearance from a Forest Officer.

2. The timber operator is responsible for the development of the Annual Operating Plan and harvest layout.

   Alberta Forest Service Forest staff is responsible for the co-ordination of resource referrals and reviews; for providing direction to timber operators; and for approval of the Annual Operating Plans.

3. Referrals to managers of renewable resources such as forest landscape, recreation, watershed and wildlife shall be conducted at the Forest Management Plan, General Development Plan, disposition preparation and

Annual Operating Plan levels to ensure consideration of concerns and timely input to planning. Referrals during the course of operations would only be conducted when determined as necessary.

Input into operating plans shall be at a level of detail sufficient to provide adequate direction to the operators for plan preparation. It is expected that they will be sufficiently familiar with ground conditions in the area to be harvested to develop the plans and be able to incorporate identified resource concerns.

4. The **Annual Operating Plan** consists of:

   (a) A **General Development Plan** which provides an overview of projected road development and harvest sequencing for the supply of timber to a mill;

   (b) A **Harvest Layout Design Map** showing locations of cutblocks and roads;

   (c) **Detailed Cutblock Plans** when required, for areas identified during the cruise and preliminary plan as sensitive or critical; and

   (d) A **Written Operating Plan** that includes the completed **Annual Operating Plan Submission Form T/M 118 or an approved equivalent, a Reforestation Plan,** the **Fire Control Plan Supplement,** and a **Road Maintenance and Abandonment Plan.**

5. **Harvest layout design preparation, submission and approval** should be conducted in a series of steps:

(a) The timber operator should be supplied with the results of the resource referral and operational cruise in a cruise report summary and map(s) in advance, as a basis to plan road and cutblock layout. This report should include stand and site assessment information, resource concerns and management implications, and planning and operating conditions to be applied to the disposition.

(b) The timber operator should submit a preliminary road and cutblock layout plan for an entire timber disposition two years in advance of logging. Review of the preliminary plan and the approval to layout should be completed one year in advance of harvest.

Cutblocks located in sensitive or critical areas requiring detailed roading, harvesting, reforestation and reclamation plans shall be identified.

In lieu of the preliminary plan, a final A.O.P. may be submitted.

(c) Depending on the term of the final A.O.P., the blocks scheduled for harvest in the upcoming operating year or season should be laid out in the field at the time of the plan submission. Ideally, the blocks should be laid out and approved for harvest before the A.O.P. submission.

Boundaries and roads must be accurately shown on the Annual Operating Plan maps.

(d) It should be noted that for large and/or complex plans it is most desirable to prepare a preliminary road and cutblock layout plan to be reviewed first for approval to layout and then for approval to harvest. For small and/or simple plans a final A.O.P. may be prepared and submitted.

It is assumed that the final plan will be based on comprehensive field work, will be quite firm and will be reviewed for approval to harvest.

A preliminary plan is an initial proposal based on the best available data (photographs, maps, cruise data etc.) supported by some field work and may require extensive changes during the review process.

(e) The process outlined is also applicable to commercial timber permits and miscellaneous timber use planning except:

- the time frame for planning may be shortened depending on urgency.
- harvest layout for miscellaneous timber use is the responsibility of the Forest Service.

6. The **Annual Operating Plan,** shall be submitted by March 1 for harvesting operations to be conducted between May 1 and October 1 and by September 1 for operations to be conducted between November 1 and April 30. Plans may also be submitted by March 1 to cover the entire upcoming operating year. The plan shall include the following detail:

(a) **General Development Plan,** based on the Forest Management Plan, provides a projection of road requirements and wood supply for a particular mill for at least five years. The plan shall be submitted once a year prior to the start of the operating year and updated annually.

The scheduling of resource referrals, the submission, review and approval of operating plans and the issuance of timber dispositions will be based on the General Development Plan.
This plan shall include in tabular and map form (scale 1:500 000 or larger) the following:

- harvest schedule indicating when all existing or upcoming dispositions are to be operated,
- production objectives for all dispositions, and
- road development schedule for all permanent roads indicating planning and construction schedules.

The plan should also include a brief report identifying key issues which will influence planning during the term of the development plan such as timber condition and the integration of watershed, wildlife, recreation and other resource concerns.

(b) **Harvest Layout Design Maps** on 1:15 000 scale Phase 3 Inventory Base and showing:

- location and class of access roads (spur roads shall be indicated if a detailed cutblock plan is required),
- location and type of watercourse crossings,

- location of first, second and deferred cuts,
- unmerchantable areas,
- permanent reserves,
- inoperable areas,
- location of springs, seepages and water source areas where identifiable,
- location of steep slopes, unstable and sensitive soils,
- key wildlife areas, and
- trapline cabins and trails, location of which are known or have been provided by the trapper(s), Fish and Wildlife or the Alberta Forest Service.

(c) **Detailed Cutblock Plans** shall be submitted when determined to be necessary for sensitive or critical areas during the cruise and preliminary plan stages. The company will be notified where sensitive areas occur and of the nature of the concern.

The purpose of detailed cutblock planning is to minimize soil disturbance and to reduce the extent of reclamation after logging. The level of detail to be shown will depend on the nature of the concern, on the complexity and sensitivity of the site and should address the items outlined in Appendix II. The plan should provide accurate information on the harvesting, reforestation and reclamation activities that will occur in an area of concern in a particular cutblock. Submission of detailed plans will only be required in exceptional cases where the concerns are based on identifiable (soil/site and others) parameters rather than on subjective perceptions.

(d) **Annual Operating Plan Submission Form.**

(e) **Reforestation Plans** shall be submitted as part of the Annual Operating Plan or as prescribed in the Timber Management Regulation when an Annual Operating Plan is not submitted.

(f) **Fire Control Plan Supplement** as prescribed in the Forest and Prairie Protection Act and Regulations thereto, for timber operations planned during the fire season April 1 to October 31.

(g) **Road Maintenance and Abandonment Plan and Maps** that address:

- roads to be kept open, maintenance program and problem areas;
- roads to be temporarily and permanently abandoned, work required, schedule and description of problem areas;
- summary and status of work completed in the previous year;
- inventory of stream crossings to be maintained on temporarily abandoned roads; and
- identified erosion problems on abandoned roads.

4. PLANNING CONSIDERATIONS AND HARVESTING CONDITIONS

4.1 Planning and Harvesting Principles

1. The harvest sequence reflects the objectives defined in the management plan for the forest management unit. **The issuance of timber dispositions and the harvesting of timber will follow the harvest sequence indicated** in the management plan.

   To accommodate the logistics of harvesting and transportation, timber disposition boundaries should be established in a manner which allows the inclusion of whole stand types and terrain features such as significant changes in topography, subwatershed divides, permanent watercourses or major roads.

2. **Harvest layout shall be based on the detailed assessment of stand and site conditions** supplied to the timber operator in a cruise report summary and maps and shall meet the requirements of sound forest management.

3. **The basic cutting system** to be adopted shall be **alternate clear cutting** in blocks or patches, normally in two passes, where the second cut is approximately equal to the first in area, volume, operability and quality. This shall not preclude the use of selective, experimental or other cutting systems.

4. **Approximately 50 per cent** of the merchantable volume covering approximately 50 per cent of the merchantable area may be harvested in the first cut (unless approved otherwise) with the balance taken in the second cut, in order to:

- minimize the impact on watershed, wildlife, aesthetics, and site productivity;
- break up the continuity of slash fuels and forest cover types; and
- reduce susceptibility to destructive agencies.

The timber operator may be required to vary the number of cuts and the percentage removal in any single cut to mitigate key concerns.

A three cut system may be implemented at the time of the second pass if a significant number of stands have become merchantable that were not considered in the original harvest design. This should be considered where total removal of the remaining stands would exceed 50 per cent of the total planning area or where cutblock sizes would be excessive.

5. **Second Cut Removals:**

(a) **Coniferous Operations.**

Removal of the second cuts in coniferous operations will not be approved until coniferous regeneration on adjacent initial cuts has met acceptable stocking level standards and has reached a minimum height of 2 m. This is to assist watershed protection; to reduce the visual impact of logging; and to provide minimal cover for wildlife. It is expected that coniferous regeneration will reach the height of 2 m within 20 years.

The retention period for second cut removal may be extended to allow coniferous regeneration to reach a specified height greater than 2 m in key visual, watershed or wildlife concern areas. Conversely, the retention period may be shortened when there is a serious risk of stand degradation.

(b) **Deciduous Operations.**

Removal of the second cuts in healthy deciduous stands will not be approved until deciduous regeneration on adjacent initial cuts has met acceptable stocking level standards and has reached a minimum height of 3 m. This is to assist watershed protection, to reduce the visual impact of logging and to provide minimal cover for wildlife. It is expected that deciduous regeneration will reach the height of 3 m within 10 years.

The retention period for second cuts in overmature deciduous stands may be shortened when there is a serious risk of stand degradation.

6. **Integrated hardwood-softwood management and harvesting** shall be practiced on designated areas to fully utilize the available allowable cut and to meet the demand for both deciduous and coniferous timber.

A spirit of co-operation must prevail between the operators to successfully implement integrated timber utilization where overlapping spheres of interest exist. Timber operators are encouraged to develop

log exchange and purchase wood programs. Integrated harvesting operations may be facilitated through improved communication, complete cutblock layout of all merchantable species and joint use of access.

7. The interests and concerns of the general public **shall be considered during harvest planning and operations and the management objectives of other resource agencies** shall be integrated with those of timber management.

8. Timber harvesting in the Eastern Slopes shall be conducted according to the management guidelines specified in the Policy for Resource Management of the Eastern Slopes. Timber harvesting is not permitted in the zone designated as Prime Protection except for wildlife habitat improvement or sanitation cutting to protect merchantable timber in other zones.

   In those areas of the province covered by approved Integrated Resource Plans, timber harvesting shall also be conducted according to these plans.

9. Harvest design and operations shall be conducted in a manner that maintains or improves the productivity of the site. Degraded sites shall be restored using acceptable reclamation procedures.

4.2 Timber Management Criteria

4.2.1 Utilization

1. All timber shall be harvested to the utilization standards specified in the timber disposition.

2. **Sawlog Utilization Standards**

(a) **15/11 Utilization.** The minimum 15/11 utilization level is defined as:

Merchantable Stand:

- at least 60 per cent of the coniferous stems must be 15 cm or greater in diameter outside bark at stump height. To establish the population, all stems 7 cm or greater in diameter outside bark at breast height will be included.
- average total height of all merchantable trees in the stand is 14 m or greater.
- the net volume of merchantable trees must be 50 m^3 per ha or greater.

Merchantable Tree:

- a merchantable tree is defined as one with a minimum stump diameter of 15 cm outside bark and a merchantable length of 4.88 m or greater to an 11 cm top diameter inside bark.

(b) **19/13 Utilization.** The minimum 19/13 utilization level is defined as:

Merchantable Stand:

- at least 50 per cent of the coniferous stems in a stand must be 19 cm or greater in diameter outside bark at stump height. To establish the population, all stems 15 cm or greater in diameter outside bark at stump height will be included.
- the net volume of merchantable trees must be 30 m^3 per ha or greater.

Merchantable Tree:

- a merchantable tree is defined as one with a minimum stump diameter of 19 cm outside bark and a merchantable length of 4.88 m or greater to a 13 cm top diameter inside bark.

(c) **Modified 19 Utilization.** In the modified 19 utilization level all trees will be harvested to a minimum stump diameter outside bark of 15 cm. This level of utilization is defined as:

Merchantable Stand:

- at least 60 per cent of the coniferous stems in a stand must be 19 cm or greater in diameter outside bark at stump height. To establish the population, all stems 15 cm or greater in diameter outside bark at stump height will be included.
- the net volume of trees having a stump diameter outside bark of 19 cm or greater must be 30 m^3 per ha or greater.

Merchantable Tree:

- a merchantable tree is defined as one with a minimum stump diameter of 15 cm outside bark and a merchantable length of 4.88 m or greater to an 11 cm top diameter inside bark.

(d) **A Merchantable Log or Broken Piece** contains a minimum of:

- 50 per cent sound wood and is
- 2.44 m in length to a 15 cm small end diameter inside bark (excluding allowance for trim); or
- 3.66 m in length to a 13 cm small end diameter inside bark (excluding allowance for trim), for 19/13 utilization; or
- 3.66 m in length with a 15 cm large end diameter outside bark to an 11 cm small end diameter inside bark (excluding allowance for trim), for 15/11 utilization.

The 15 cm large end diameter does not apply to pieces produced from merchantable trees as a result of improper bucking. Such pieces must be utilized, even where the large end diameter is less than 15 cm.

Butts or larger ends exhibiting rot greater than 50 per cent in basal area will be bucked at 0.61 m (2.0 ft.)intervals or less to 50 per cent sound wood in basal area.

3. **Deciduous Utilization Standards**

(a) A merchantable deciduous stand is a stand where the net volume of merchantable trees is 50 m^3 per ha or greater.

(b) A merchantable deciduous tree for fiber, wafer or strand products is defined as one with a minimum stump diameter of 17 cm outside bark and a merchantable length of 5.2 m or greater (including allowance for trim) to a 9 cm top diameter inside bark or to the point where heavy branching prevents utilization.

(c) A merchantable log or broken piece for fiber, wafer or strand products contains a minimum of 50 per cent sound wood in basal area at the butt or larger end and is 2.6 m in length (including allowance for trim) to a 9 cm small end diameter inside bark.

The operator shall not be expected to manufacture merchantable logs from non-merchantable trees or to utilize legitimately broken pieces originating from such trees.

On hardwood lumber operations, rot greater than 50 per cent in basal area will be bucked at 0.61 m (2.0 ft.) intervals or less to 50 per cent sound wood in basal area. Material not suitable for manufacture of lumber but suitable for fibre, wafer or strand products will be utilized where the market exists.

4. All merchantable standing and merchantable fallen dead timber shall be utilized.

5. Merchantable trees shall be bucked into merchantable log lengths.

6. Breakage or mechanical damage to merchantable trees shall be kept to a minimum.
7. Broken pieces originating from a merchantable tree that meet or exceed the minimum piece size specifications shall be utilized.
8. Merchantable trees shall be decked in a manner that avoids waste.
9. All timber shall be removed for manufacture within one year of felling.
10. Unmerchantable live residual trees shall be left standing where practical unless otherwise approved.
11. Thrifty coniferous understories of acceptable species shall be protected from unnecessary damage during logging of hardwoods where the density of the understory is equal to or is greater than 250 stems per ha. In such instances, harvesting operations shall be modified to ensure damage to the coniferous understory is kept to an acceptable minimum.

4.2.2 Overlapping Deciduous and Coniferous Operations

1. Where overlapping spheres of interest exist, coniferous and deciduous operations shall be integrated to provide for the maintenance of existing allowable cuts and full utilization of the timber resource.
2. Harvest layout design shall include all merchantable coniferous and deciduous stands.
3. Coniferous Operations:
   (a) Coniferous operations should be programmed into primarily coniferous areas and into those mixed wood areas where the coniferous growing stock contributes to the A.A.C.

(b) Coniferous operations should be deferred in mixed wood stands containing low volumes of conifers unless arrangements have been made for the removal of the deciduous timber during or immediately following logging of the conifers.

(c) Coniferous operators may be programmed to follow deciduous harvesting while access exists where there is opportunity to remove embedded coniferous stands or residual coniferous trees from these cutovers. Cutovers which are part of the deciduous land base should have residual coniferous trees removed in the same season the deciduous component is logged to avoid damage to deciduous regeneration.

(d) All harvested areas within the coniferous land base shall be regenerated to conifer, unless directed otherwise. If the cutover is to be converted to deciduous, the area must be reforested to provincial standards for deciduous regeneration.

4. Deciduous Operations:

(a) Hardwood operations should be confined to primarily deciduous areas where possible, and to those mixed wood stands where the deciduous growing stock contributes to the Deciduous Timber Allocation allowable cut.

(b) Harvesting of embedded deciduous stands and deciduous residual trees may also be sequenced to coincide with or immediately follow coniferous operations while access exists.

(c) The hardwood operator shall harvest all pure deciduous stands and mixed wood stands containing minor amounts of conifers. Coniferous timber in these stands should be removed in the same season of operation, where possible. These stands shall be regenerated

to deciduous species, unless directed otherwise. If the cutover is to be converted to conifer, the area shall be reforested to provincial standards for coniferous regeneration.

It is desirable that the hardwood operator also harvest the interspersed and embedded coniferous stands.

(d) The coniferous component of those mixed wood stands that contribute to the coniferous allowable cut may be harvested by the deciduous operator provided that prior arrangements have been made with the coniferous quota holder.

4.2.3 Timber Condition

1. The oldest and poorest condition timber shall be removed in the first cut, wherever feasible.
2. Stands containing serious blowdown, infestation by insects or disease, dead timber or other high risk timber shall be given a high priority for removal. A harvesting proposal, such as progressive clearcutting, that differs from normal layout design may be submitted for consideration, but such proposals must be based on factual information obtained from stand and site assessments.
3. Healthy, vigorous stands shall be retained as part of the second cut wherever possible.

4.2.4 Operability

1. Slope, soil, timber volumes and logging equipment to be used, must all be considered when planning logging operations, reforestation treatments and reclamation on steep slopes. The objective is to ensure that soil disturbance, erosion and watercourse sedimentation are kept to an acceptable minimum.

The intensity of planning required shall be determined by the complexity and sensitivity of the site conditions and the degree of disturbance expected.

2. Harvesting on slopes steeper than 45 per cent should not be done with conventional wheeled skidders.

   Alternative equipment, such as tracked skidders, high flotation wheeled skidders and cable yarders should be considered for logging slopes exceeding 45 per cent and for logging on sensitive areas.

4.2.5 Cutblock Layout Requirements

1. All merchantable stands in a timber disposition shall be included in the cutblock layout plan unless they are located in an area excluded (temporarily or permanently) from timber harvesting. The policy for harvesting timber is to remove the oldest timber first. Thus, priority must be placed on including mature and overmature timber in the blocks designated for first cut.

   Any stand which reaches rotation age before completion of the second cuts should normally be included in the total harvest design.

2. Cutblock boundaries should follow natural terrain features, contours and timber type boundaries where possible to minimize the impact on watershed, blowdown and aesthetics; and to benefit wildlife, silviculture and logistics of harvesting.
3. Second cut stands should be interspersed evenly amongst the first and shall be of similar size and shape.

4. Access to cutblocks scheduled for second cuts and the logistics of extracting timber from these blocks shall be considered in the design of the first pass blocks.
5. Permanent sample plots shall be shown on current forest cover maps and shall be reserved from harvesting and protected from blowdown. In an exceptional case, a plot may be approved for harvest. Such a plot shall not be disturbed until it has been remeasured and the cutblock released for harvesting by the Alberta Forest Service.
6. Windfirm buffers shall be established where required to mitigate harmful impacts on aesthetics, watercourses, fisheries and wildlife.

Buffer areas are to be managed differently from cutblocks. Removal of merchantable timber may be considered by partial cutting or alternate clearcutting at a smaller scale, provided that the integrity of the buffer is maintained. Cutovers within buffer areas shall be reforested to provincial standards, but in the case of protective buffers along waterbodies, by a method that will not contribute to sedimentation.

4.2.6 Block Size

1. Block size, width and shape should be determined by regeneration and silvicultural requirements of the species being managed and by considerations for aesthetics, watershed and wildlife. Size and shape of cutblocks are expected to vary to fit the terrain and stand types. The microclimate of the proposed cutover must also be considered and special measures shall be taken where the need to conserve soil moisture is identified.

2. Pine Blocks: Stands in which 40 per cent or more of the merchantable timber volume is in pine may be laid out to pine standards. The cutblocks shall average no more than 60 ha, but may vary up to 100 ha in size.

3. Deciduous Blocks: shall be the same as those specified for pine cutblocks.

4. Spruce Blocks: Cut blocks in spruce stands may be laid out in:

   (a) Patches to a maximum of 24 ha;

   (b) Strips to a maximum of 32 ha where no part of the cutover is further than 150 m from a seed source; or

   (c) Blocks to the dimensions specified for pine stands, where a timber operator who has the responsibility for reforestation makes a formal written commitment to treat and plant the cutover within 24 months of harvesting.

5. Harvesting proposals that exceed ground rule limits must be supported with documentation based on stand and site assessments and shall be referred to the Timber Management Branch for approval. Such proposals must demonstrate that potential harmful impacts on soils, watershed, wildlife, aesthetics and other values are or will be mitigated and must also include an acceptable plan for reforestation, appropriate for the site conditions.

6. Cutblocks in previous selectively cut stands which are satisfactorily stocked to conifers, two metres or more in height, may exceed the size constraints provided an acceptable logging plan is submitted which shows that the minimum stocking level will be maintained with good quality conifers. If the regeneration stocking cannot be maintained at the time of harvest, the appropriate alternate cut and leave system will be employed in the layout.

4.2.7 Contingency Planning

1. Areas of timber accessible at any time of the year should be identified and set aside for contingency use. Contingency cutblocks should be specified in the Annual Operating Plan and should fit in the harvest sequence as much as possible.
2. Logging and scarification with heavy equipment shall be stopped during wet soil conditions to avoid excessive damage to the soil structure. Contingency cutblocks may be considered for alternative working areas.
3. Written authority from the Forest Superintendent is required before harvesting a contingency cutblock.

4.3 Reforestation

1. A timber operator with reforestation responsibilities shall reforest all cutover lands according to the terms of the timber disposition and the Timber Management Regulation.
2. Reforestation techniques conducive to enhanced growth and yield of regenerated stands should be employed. This may be accomplished through any or all of the following:
   (a) matching of species to site,
   (b) control of spatial distribution of crop trees, and
   (c) site treatment to enhance the micro and macro environment for seedling establishment and growth.
3. The preferred reforestation method from the perspective of enhancing growth and yield potential is to plant genetically improved seedling stock, as it becomes available.

Reforestation methods will vary according to the regeneration characteristics of the managed species and must be properly adapted to the site conditions.

4. The arrangement of blocks, patches and strips designated to be cutover or retained shall be designed to meet the silvicultural requirements of the stands being managed.
5. Whenever conditions permit, individual cutblocks should be confined to areas which require similar reforestation treatments to accommodate efficient and effective reforestation.
6. Cutblocks shall be designed and operations shall be conducted in a manner that will prevent damage to regeneration on previous cutovers when second or subsequent pass blocks are harvested.
7. Reforestation treatment shall be conducted in a manner that minimizes soil erosion and watercourse sedimentation.
8. Scarification treatments will be permitted within water source areas and in areas subject to normal seasonal flooding during dry or frozen periods provided that disturbance is kept to a minimum by spot scarifying or other appropriate methods. Equipment must be kept away from the watercourse and the banks must not be disturbed.

   Scarification equipment shall only be permitted to cross a watercourse at improved crossings, or during frozen periods to protect the banks and streambed from disturbance.
9. On hardwood sites to be regenerated to hardwoods, the cutblocks should be located in stands where harvesting will result in a minimum 60 percent canopy removal in order to promote regeneration by suckering.

Where this level of exposure is not achieved because of the presence of unmerchantable trees and other unusable hardwoods, felling of these during or after logging may be necessary to promote warming of the soil and enhance suckering.

10. Road tenure and reclamation planning shall consider reforestation treatment scheduling.

4.4 Forest Protection

1. Firefighting equipment shall be on hand and maintained as prescribed in the Forest and Prairie Protection Act and Regulations thereto. All operating conditions specified in the timber disposition or approved Annual Operating Plan will also be complied with.
2. Debris disposal and slash hazard reduction shall be completed progressively in accordance with the Forest and Prairie Protection Regulations Part II, and the "Logging Slash Hazard Evaluation and Prescribed Burning Manual."
3. Proposals for prescribed burning for slash hazard reduction or silvicultural treatment shall be submitted as part of the Annual Operating Plan with a cutblock design that accommodates effective burning and fire control.

A detailed burning plan shall be submitted as an addendum to the A.O.P. and shall include:

(a) detail on terrain, watercourse and fuel types,

(b) the location of cutblock boundaries, roads, landings, and skid trails, and

(c) the burning and control prescription for each cutblock.

4.5 Forest Landscape Management

1. The Forest Landscape Management Policy shall apply in visually sensitive areas.
2. The Forest Landscape Management Guidelines shall be used to identify visual resources, their sensitivity and vulnerability, and to set objectives for their management, when in place.
3. In visually sensitive areas, the guidelines shall be applied to help determine the visual impact potential of proposed harvest operations.
4. In harvest operations with significant potential for visual impact, the guidelines shall be applied during the appropriate planning, operational, and post-harvest treatment phases to help avoid or mitigate adverse visual impact inconsistent with visual management objectives and good forest management practices.

4.6 Watershed Protection

1. Operations shall be conducted in a manner that minimizes soil disturbance and surface flow of water over exposed mineral soil to reduce the volume of sediment entering the watercourse.
2. Watercourses shall be evaluated and classified according to Tables 1 and 2 to determine protection requirements and to assist in the planning and supervision of operations.
3. Buffers shall be established to prevent mineral soil disturbance and maintain a protective cover of duff and lesser vegetation adjacent to watercourses.

TABLE 1

WATERCOURSE CLASSIFICATION

Watercourse Classification	Physical Description	Portion of Year Water Flows	Channel Development	Land Use Impact	Fisheries Concerns
Large Permanent	- major streams or rivers - well defined flood plains - valley usually exceeds 400 metres in width	- all year	- unvegetated channel width greater than 5 metres	- water quality often reflects all upstream land use impacts and natural erosion processes	- resident fisheries (most important of entire fisheries habitat)
Small Permanent	- permanent streams - often small valleys - bench (flood plain) development	- all year but may completely freeze in the winter	- banks and channel well defined - gravel and rubble usually present in channel - channel width 0.5 to 5 metres	- water quality - fisheries populations sensitive to siltation	- significant insect populations - spawning and seasonal habitat during higher flow periods - resident fish populations in larger streams
Intermittent	- small stream channels - small springs are main source outside of periods of spring runoff and heavy rainfall	- during wet season or during storms - dries up during season of drought	- distinct channel development - usually channel is non-vegetated - channel width to 0.5 metres - some bank development	- deposition of sediment during flow periods will damage fish and invertebrate habitat and effect higher order streams into which it flows	- production area for important food sources - drift invertebrate populations in pools and riffles - blockages prevent fish passage for spawning
Ephemeral	- often a vegetated draw	- flows only during and immediately after rainfall or snowmelt	- little or no channel development - channel is usually vegetated	- sediment production during flow periods as a result of soil disturbance	- only as influence on water quality downstream

TABLE 2

OPERATING GROUND RULES FOR WATERCOURSES

Watercourse Classification	Mapping Designation	Roads, Landings, Bared Areas	Watercourse Protective Buffers	Operating Conditions Within Buffers and Water Source Areas	
				Tree Felling	Equipment Operation
Large Permanent	- solid heavy line or double line	- not permitted within 100 metres of the high-water mark without the written approval of a Forest Officer	- no disturbance or removal of merchantable timber within 60 metres of the high-water mark except where specifically approved in writing following inspection by a Forest Officer	- trees will be felled away from the watercourse within these areas - no slash or debris is to enter the watercourse - should slash or debris enter the watercourse, immediate removal is required without the machine entering the watercourse	- heavy equipment may only operate within water source areas and high-water mark areas during dry or frozen periods, subject to specific operating conditions - during unfrozen or wet periods, equipment is to remain outside these areas while removing timber
Small Permanent	- usually solid lines though some are heavy broken lines	- not permitted within 100 metres of the high-water mark without the written approval of a Forest Officer	- no disturbance of any kind within 30 metres of the high-water mark except in areas of gentle terrain (less than 30% slope) where neither bank is strongly sloped - where possible topographic breaks may be used as buffer boundaries	- trees are to be felled away from the watercourse within these areas unless otherwise approved in writing by a Forest Officer - no slash or debris is to enter the watercourse - should slash or debris enter the watercourse, immediate removal is required without the machine entering the watercourse	- heavy equipment may only operate within water source areas and high-water mark areas during dry or frozen periods, subject to specific operating conditions - during unfrozen or wet periods, equipment is to remain outside these areas while removing timber
Intermittent	- usually broken light line - should be identified on ground	- not permitted within 30 metres of a watercourse	- buffer of brush and lesser vegetation to be undisturbed along the channel - width of buffer will vary according to soils, topography, water source areas and fisheries values - treed buffer is not required unless specifically requested by a Forest Officer	- trees are to be felled away from the watercourse wherever practical - large accumulations of slash or debris in the channel will be removed progressively	- where fish spawning movements have been identified, special crossings must be provided - random skidding in and through the channel or water source areas will only be permitted during frozen conditions - planned and adequate crossings will be required during unfrozen periods to prevent rutting and minimize soil exposure - where temporary crossings have been constructed, removal will be required unless retention is authorized in writing by a Forest Officer - operations shall be conducted in a manner that minimizes disturbance to the duff layer and soil
Ephemeral	- not identified on maps - should be identified on the ground and illustrated on an operations map if recommended by the site assessment	- construction not permitted within a watercourse or a water source area	- not required		- as per intermittent watercourses except for the following: (i) heavy equipment may cross only when activity will not result in any erosion and sedimentation (ii) planned and adequate crossings will be required during wet periods to prevent rutting and minimize soil exposure
Lakes - little or no recreation, waterfowl, or sport fishing potential	- solid line	- not permitted within 100 metres of the high-water mark without the written approval of a Forest Officer	- on lakes exceeding 16 ha. in area, there will be no disturbance or removal of timber within 100 metres of the high-water mark except after inspection and approval by a Forest Officer	- trees within these areas are to be felled away from the water body - no slash or debris is to enter the water	- heavy equipment may only operate within the high-water mark or water source areas during dry or frozen periods, subject to specific operating conditions - during unfrozen or wet periods, equipment is to remain outside the high-water mark while removing timber
Lakes - with recreational, waterfowl, or sport fishing potential	- solid line - lakes will be identified by the Department of Forestry, Lands and Wildlife and the Company advised - reserved areas will be indicated on the appropriate maps	- for the shorelines not located within reserved areas, no disturbances will be permitted within 200 metres of the high-water mark without written approval of the Forest Superintendent	- on lakes exceeding 4 ha. in area, there will be no disturbances or timber removal within 100 metres of the high-water mark, except after inspection and approval by a Forest Officer	- trees within these areas are to be felled away from the water body - no slash or debris is to enter the water body	- heavy equipment may only operate within the high-water mark or water source areas during dry or frozen periods, subject to specific operating conditions - during unfrozen or wet periods, equipment is to remain outside the high-water mark while removing timber - consideration must be given to aesthetics when harvesting adjacent to lakes with recreational potential - any timber harvesting within reserved areas shall be conducted subject to specific operating conditions

NOTE: Scarification treatment will be permitted within water source areas and the high-water mark of any watercourse or lake during dry or frozen periods provided that disturbance is kept to a minimum by spot scarifying or other appropriate methods. Equipment must be kept away from the banks of watercourses or shores of lakes. Scarification equipment shall only be permitted to cross a watercourse at improved crossings or during frozen periods to protect the banks and streambed from disturbance.

4. Water source areas and areas subject to normal, seasonal flooding may be logged during dry or frozen periods according to specific operating conditions contained in the approved Annual Operating Plan. Construction of spur roads in water source areas shall be confined to frozen periods, with snow cover. The objective is to minimize disturbance to the duff layer and exposure of the mineral soil in both cases.

4.7 Wildlife Habitat

1. Timber harvesting is recognized to have a significant impact on the management of fish and wildlife and will be conducted in a manner that is compatible with fish and wildlife objectives.
2. The Fish and Wildlife Division is expected to identify important wildlife species, their key areas and major management requirements. Fish and Wildlife will provide this information to the Alberta Forest Service at least five years in advance of cutting based on the General Development Plan. Detailed wildlife concerns and management opportunities will be addressed at the operational cruise and the preliminary cutblock design phase of the Annual Operating Plan submission.
3. The design of harvest layout, the construction and tenure of access roads, and the organization of logging operations are to be conducted in a manner that is sensitive to the needs of wildlife species designated as important in the Forest Management Unit; for a balance of food, cover and protection to maintain or enhance viable populations.

Block width and line of sight are the most important factors in cut-block design from a wildlife point of view.

4. Buffer areas shall be established where required and as identified at the operational cruise stage. Examples of where buffers are required include the retention of riparian vegetation along watercourses and the provision of protective cover along ungulate travel corridors, and around natural meadows and mineral licks.

5. The timber operators shall contact all registered trappers within their area of interest who may be affected by the proposed timber harvesting and provide them with a copy of the five year timber harvest projection plan and with copies of all subsequent revisions. Maps of cut projections and progression will be included in the plan provided to the trappers.

The timber operator should discuss the harvesting plans with the trapper(s) during the development of Annual Operating Plans to identify concerns, determine need for plan revisions and resolve conflicts.

Personal contact shall be made again at least 10 days prior to start of logging.

Traditional access trails or suitable alternatives shall be retained. Trapline cabins and trails shall be located on the annual operating plan map if that information is known or has been provided by the trapper(s), Fish and Wildlife or the Alberta Forest Service.

5. ROAD PLANNING AND CONSTRUCTION

5.1 Road Planning and Construction Schedule

The Company shall submit a schedule for road planning and construction, as part of the General Development Plan as illustrated in Appendix 1. It should provide a schedule for plan submission and construction. The general location of the road should be indicated on the General Development Plan map.

5.2 Planning Permanent Roads

Road planning and construction is to be conducted in accordance with the Resource Road Planning Guidelines (ENR Technical Report No. T/25). A summary of these guidelines is presented here to provide direction for the planning and construction of roads.

This procedure outlines the planning process to be followed. The purpose in planning is to minimize environmental impact. The level of planning required is determined by the road standard, the complexity of terrain and the degree of disturbance that will occur. The details required for plan submissions are determined at each planning phase.

The timber operator shall submit plans in three phases at increased levels of detail for all permanent roads to be built under authority of a Licence of Occupation or an approved Annual Operating Plan. A permanent road is one which will exist for two years or more and includes seasonally used roads.

Proposed roads shall be identified by class in relation to their expected life, use and design specifications as listed in Table 3.

1. Phase I - Regional Corridor Plan. The regional corridor plan shall outline the general location of a road (plus or minus 1 km) and justify the need for a proposed road. This level of planning includes location, assessment and comparison of alternative corridor locations based on terrain analysis at 1:50 000 - 1:100 000 scale.

   During Phase I preparation and approval, the planning requirements for the detailed plan should be identified.

2. Phase II - Detailed Planning. The objective of the detailed plan is to select a route that minimizes environmental impact and optimizes timber harvesting and hauling efficiency. The detailed road plan may include one or any of the following:
   (a) 1:15 000 scale Phase III maps showing the route alignment and stream crossings;
   (b) Aerial photographs, aerial photo mosaics or orthophoto maps indicating route alignment;
   (c) Survey profiles of the centre line, where required;

TABLE 3

ROAD STANDARDS

ROAD DESCRIPTION		ROUTE SELECTION PROCESS		ENVIRONMENTAL		PROTEC																	
ROAD CLASS	TERM OF LIFE	PHASE I	PHASE II	DETAILED PLAN PREPARATION	FIELD LAYOUT	DESIGN AND																	
						f. RIGHT OF WAY							ALIGNMENT										
						Clearing Width	Back b. Slopes		Fill Slopes		Road Surface	Drainage Ditch	d. Gradients				Sight Distance	Minimum Radius of Curve	Design Speed
							E	R	E	R			F		A				
													S	P	S	P			
I	Permanent	Phase I	Phase II	Detailed design plan on air photos or photo mosaics. Cross sectional profiles for stream crossings and cuts and fills over 1.5m. Types of structures for stream crossings, erosion control measures, hydrological information, revegetation and reconnaissance. Right-of-way requirements specified and where any additional requirements may be necessary.	Centerline and stations marked before A.F.S. field inspection. Both sides of right-of-way to be marked before construction commences. Cuts and fills over 1.5m must be staked. Any additional right-of-way requirements to accomodate cuts and fills will be determined during A.F.S. inspection for approval.	40m	2:1	3:1	1.25:1	3:1	10m	Rounded or Scraped	5	7	4	5	180m	300m	90 km/h
II	Permanent	Phase I	Phase II	See class I	See class I	30m	2:1	3:1	1.25:1	3:1	10 m	Rounded or Scraped	6	8	5	6	150m	230m	80 km/h
III	Permanent	Phase I	Phase II	See class I	See class I	20m	2:1	3:1	1.25:1	3:1	8m	Rounded or Scraped	8	10	6	8	90m	120m	60 km/h
IV	Permanent	–	Phase II	See class I	See class I	10-20m	2:1	3:1	1.25:1	3:1	6m	See class IV temporary	10	12	8	10	45m	50m	40 km/h
IV	Temporary	–	Phase II	Road alignment plan on aerial photographs and forest cover maps. Profiles of critical areas (cuts, fills, and stream crossings). Types of structures for stream crossings.	a. Centerline marked for A.F.S. field inspection. Both sides of right-of-way marked before construction commences.	e. 10-20m	c. 2:1	3:1	c. 1.25:1	3:1	6m	"V" ditches where required. Ditches should be rock lined where site specifics (grade and slope) may dictate their use.	10	12	8	10	45m	50m	40 km/h
V	Temporary	–	Phase II	See class IV temporary	See class IV temporary	e. 8-20m	2:1	3:1	1.25:1	3:1	5m	See class IV temporary	12	14	12	14	—	—	—

a. For temporary Class IV and V roads, centerlines shall be marked for inspection on critical or sensitive locations and when requested by a Forest Officer. When such marking is requested, the Forest Officer shall be available for inspection.

b. N-normal soils, E-erodible soils.

c. On normal soils, back and fill slopes may vary from the standards specified for temporary Class IV and V roads, within reasonable limits.

d. F-favorable, A-adverse, S-sustained, P-pitch.

e. Class IV and V roads have a maximum clearing width of 20 m. Terra and/or additional facilities on right-of-way may dictate a 20 m righ of-way from the desired 10 m and 8 m for Class IV and V respectively.

f. Clearing widths may be increased with the written approval of a Fore Officer.

TABLE 3

ROAD STANDARDS

PROTECTION AND ALIGNMENT				GUIDELINES FOR CONSTRUCTION							ROAD ABANDONMENT	
	Sight Distance	Minimum Radius of Curve	Design Speed	BORROW PITS	TIMBER SALVAGE	DEBRIS DISPOSAL	STREAM CROSSINGS: BRIDGES	STREAM CROSSINGS: CULVERTS	EROSION CONTROL AND REVEGETATION	MAINTENANCE	TEMPORARY	PERMANENT
5	180m	300m	90 km/h	Locations identified before construction commences and site tested for materials and ground water levels before clearing of borrow area. Dog-legged access or access constructed at an angle with buffer to off right-of-way borrow pits. Borrow pits located on the right-of-way should be incorporated by variable width and recontouring.	Timber salvage will be done as per timber management regulations.	Total disposal except stumpings and fine debris (10cm or less) to be retained for erosion control by spreading on cuts and fills and any other critical areas and walked in by a crawler.	Bridges are the preferred crossing structure and may be required where biological, hydraulic and/or terrain characteristics are significant. Should be designed to facilitate other resource users.	Culverts 1.8m in diameter or over to have installation supervised by an engineer. Culverts with diameter less than 1.8m to be supervised by a qualified project manager. All culverts designed for 1:50 yr. flood level. All culverts to be rip-rapped and aproned. Culverts placed in fish bearing streams must facilitate fish passage	Progressive reclamation (recontouring cuts and fills and revegetation) concurrent with construction. Recommended seed mixture as per the resource handbook to be applied by hydroseeding, mulching, or other approved means. Cross drains and ditch blocks dictated by slope and soil conditions. Drainage water to be diverted off the right-of-way in as short a distance as possible.	Annual maintenance required. Maintenance plan may also be required.	Removal of all crossing structures, additional erosion control measures implemented and active maintenance required.	Complete removal of all crossing structures and engineering aspects of the road. Recontouring of road to regain natural slope and revegetating and seeding of right-of-way.
6	150m	230m	80 km/h	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I
8	90m	120m	60 km/h	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I
10	45m	50m	40 km/h	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I	See class I
10	45m	50m	40 km/h	Use of small borrow pits incorporated into right-of-way where possible.	See class I	Partial disposal -mechanical or manual cutting of accumulated slash and debris to reduce fire hazard to acceptable levels. Must be spread on right-of-way and walked in by a crawler.	Portable bridges and/or native timber bridges are preferred (See class I) Properly constructed log fills or ice bridges on intermittent streams. Temporary crossings must be removed before spring breakup.	See class I Designed for a 1:25 year flood level.	See class I Portable seed broadcasters or manual casting may be used.	See class I	See class I	See class I
14	—	—	—	See class III temporary	See class I	See class III temporary	See class III temporary	See class III temporary	See class III temporary	See class I	See class I	See class I

-pitch.

clearing width of 20 m. Terrain
-of-way may dictate a 20 m right-
for Class IV and V respectively.

the written approval of a Forest

(d) Cross sectional profiles for approaches to streams and for routes on steep terrain requiring side hill cuts;

(e) Descriptions of watercourse crossings and the procedure used in determining the size and the type of crossing structure;

(f) Statement identifying key factors that influenced final route selection; and

(g) Description of measures developed in consultation with the Alberta Forest Service for mitigation of key environmental concerns.

Upon written approval of the detailed plan, the timber operator may submit an application for a Licence of Occupation.

3. Phase III - Construction Phase. This phase includes the request for approval to commence clearing and construction, subject to specific operating conditions. Prior to clearing, the timber operator will supply detailed plans or designs for watercourse crossings where determined as necessary by the detailed plan, for inspection and operational control.

5.3 Planning Temporary Roads

1. Class IV and V temporary roads to cutblocks must be indicated in the Annual Operating Plan and include the location and type of stream crossings required.

The actual type and size of the crossings will be determined by season of use, life expectancy of the crossing and the type and size of the stream. The operator may use a variety of structures including

culverts, log bridges and log or snow fills depending on the conditions at time of intended use. The objective is to minimize erosion and sedimentation, to avoid restricting stream flow and to ensure fish passage in fish bearing streams.

2. Phase II planning level of detail for permanent roads may be required for crossing permanent watercourses and on critical sites, where the need for such is determined during review of the preliminary harvest layout plan.
3. Access for reforestation must be considered in determining the use and life of the road. Erosion control measures shall be maintained until the road is abandoned and reclaimed.

5.4 Upgrading of Existing Roads and Re-use of Abandoned Roads

Proposals to upgrade existing roads or to re-use abandoned roads including re-alignment, reconstruction or re-installation of stream crossings, are subject to the requirements and conditions for planning and approval that are applicable to development of new roads.

5.5 Road, Landing, Skid Trail and Stream Crossing Location

General guidelines to be followed in locating roads, landings, skid trails and stream crossings, include the following:

1. Roads, skid trails and landings shall be placed in locations where soil disturbance and impacts on watercourses can be minimized by:

(a) avoiding unstable areas, water source areas, springs and seepages; and

(b) following natural benches, moderate slopes, and ridges to minimize cuts and fills.

2. To minimize erosion and sedimentation, watercourse crossings shall:

(a) have stable approaches,

(b) be at right angles to the watercourse,

(c) be at locations where channels are well defined, unobstructed and straight,

(d) be at a narrow point along the watercourse, and

(e) allow room for direct gentle approaches.

3. During the second cut, borrow pits and landings shall not be located in established regeneration on the initial cutovers if at all possible. Unauthorized damage to regeneration is to be promptly repaired by replanting.

4. Road access to shores of lakes and watercourses shall be limited to approved routes.

5. Unless approved otherwise, roads, landings and bared surface areas shall not be constructed within:

(a) 100 m of the highwater mark of any permanent watercourse,

(b) 30 m of any intermittent watercourse,

(c) an ephemeral draw, and

(d) a water source area including seeps or springs.

5.6 Clearing and Construction of Roads and Landings

1. Merchantable timber on rights-of-way and landings shall be pre-logged prior to clearing and should be utilized during the same operating season.
2. Road rights-of-way shall be no wider than necessary for construction of a specified class of road, in locations other than in approved cutblocks, cut and fill areas, or where a variable width right-of-way is aesthetically desirable. It is recognized that reasonable increases in clearing widths may be required on sloping terrain to remove shading and to accomodate rapid drying of the road surface.
3. Debris from clearing of roads and landings shall be disposed of in accordance with the Forest and Prairie Protection Regulations, Part II.
4. A portion of the clearing debris and the strippings from constructing roads and landings shall be retained and used to assist revegetation and erosion control on the disturbed areas.
5. Construction in identified problem areas shall be carried out during periods of favourable weather with proper fill material.
6. All necessary safeguards shall be taken to prevent stream sedimentation when building roads near streams.
7. At approaches to watercourse crossings, the organic duff and ground vegetation should only be removed from areas requiring earthwork and done only at the time of installation to minimize stream sedimentation.
8. Incomplete road grades, subject to erosion, should be cross-drained before final grading to minimize erosion.

5.7 Cross Section

1. Slopes on cuts shall be regular in profile from the top of the cut to the bottom of the ditch, with no hanging banks or sharply cut ditches.
2. Cut and fill slopes shall be within the road standards as specified in Table 3, except for rock cuts.
3. Timber shall be removed to an acceptable distance from the top of a road cut on unstable back slopes.

5.8 Erosion Control and Road Drainage

1. Studies have shown that erosion and sedimentation are most serious during and immediately after construction. Detrimental effects can, however, continue or even increase as the road ages, unless corrective measures are taken.

   Erosion control is part of the construction phase. Bared surfaces along rights-of-way require erosion control devices and revegetation.

   Revegetation means a dense vegetative mat which will hold soil in place and minimize erosion. It may also require the planting of shrubs or trees on areas where there is a serious erosion and sedimentation hazard. Establishment of a vegetative cover may require seeding, planting, fertilizing, mulching, contour trenching or other means of slope stabilization.

2. Erosion control and revegetation shall be concurrent with summer grade construction for all classes of roads. Preferably, no more than 2 km of bared surface area should be permitted from subgrade construction to completion of erosion control measures at any given time. All erosion control and revegetation measures shall be completed in the same season of construction, during the frost free period.
3. Erosion control structures shall be in place before decking timber on bared surface areas along road rights-of-way.
4. Proper drainage shall be included in road construction to disperse water and minimize erosion on the road surface, cut and fill slopes and ditches.
5. Cross drainage culverts and other drainage devices shall be placed at an angle to the road to attain maximum efficiency.
6. Drainage structures shall be installed as subgrade construction progresses to minimize erosion.
7. Cross drainage culverts of proper size shall be installed to:
   (a) minimize water movement along ditches;
   (b) divert water off the right-of-way into the surrounding vegetation in as short a distance as possible; and
   (c) provide cross drainage for seepages and springs.
8. Where conditions do not permit cross drains, other measures such as ditch blocks should be used.
9. Culverts which discharge water on to unstable or fill areas shall be provided with down spouts and/or adequate spillways.
10. Culverts should be rip-rapped, as necessary, to prevent erosion at both inflow and outflow ends.

11. Ditches shall be constructed to the same grade as the road and sufficiently deep to drain the subgrade.
12. Ditches shall not drain directly into watercourses.
13. Landings used in summer shall be constructed in a manner which minimize run-off on newly exposed soil.
14. Buffers shall be left where roads on steep slopes are close to important streams. A system of obstruction (e.g. logs, rocks, mounds, etc.) shall be placed between the culvert outlet and watercourse to dissipate the energy of water movement, where buffers are not effectively retarding sediment movement.

5.9 Watercourse Crossings

1. Designs of proposed bridges and culvert crossings of permanent and intermittent streams shall be shown in the Detailed Road Plan or Annual Operating Plan, where determined as necessary. Plans for all crossings of permanent streams are referred to the Fish and Wildlife Division for comments prior to approval.
2. Watercourse crossings should be designed and installed in accordance with the Stream Crossing Guidelines - Operational Guidelines for Industry, ENR Technical Report No. T/80.

A summary of these guidelines is presented to provide direction for the planning and installation of watercourse crossings.

3. Watercourse crossings must be designed and installed to meet peak flows. Permanent crossings of permanent streams should be designed for 1:50 year flood levels, and for 1:25 year flood levels for temporary crossings of permanent streams.

4. Culvert sizes shall be calculated by using at least two acceptable methods to ensure the proper size is determined rather than estimated.

   The ENR Technical Publication, "Culvert Sizing for Stream Crossings" may be used as a guideline. It is recommended that two of the following techniques be employed to determine culvert size: the Fish and Wildlife technique, the Rational formula, or the Burkli-Ziegler formula. However, the use of other approved methods is acceptable.

5. A permit from the Water Resource Division of Alberta Environment is required for:

   (i) Proposals for stream diversion or alteration; and

   (ii) Watercourse crossings:

   - requiring a culvert capacity equal to or greater than 1.5 m in diameter (the exception to this would be winter operation crossings that use an ice bridge or snowfill; in these situations no permit would be required regardless of the size of the crossing),
   - that require a bridge of more than one span, i.e., a native timber bridge of one span or a Bailey bridge would not require a permit, and
   - associated with Alberta Transportation.

   A detailed description of the work proposed and engineered designs shall be submitted with the plan proposal.

6. If proposed timber operations affect navigable waters, the timber operator shall contact the Regional Director, Marine Services, 549 Howe Street, Vancouver, British Columbia, Phone: (604) 666-6111 to determine the requirements of the Navigable Water Protection Act.
7. Bridge abutments should be placed in areas that do not constrict stream flow.
8. Culverts shall be installed to maintain the natural drainage channel of watercourses.
9. Crossings of fish bearing streams must be designed and installed in a manner which does not restrict fish passage.
10. Installation of culverts and bridges shall be timed so as not to interfere with fish spawning migration or disturb spawning areas.
11. The outflow ends of culverts should be provided with downspouts or other suitable drains to prevent erosion where hanging culverts on non-fish bearing streams have occurred. Rock or concrete aprons may be required to decrease water velocity and prevent stream channel scouring.
12. Soil or deleterious material shall not be deposited into or pushed through any watercourse or on to the ice of any watercourse.
13. Construction vehicles should ford any permanent watercourse in only one location.
14. Temporary winter crossings on any watercourse shall be completely removed before spring breakup. Where extended use of a seasonal or temporary road is required for activities such as reforestation treatment or future logging operations, temporary stream crossings shall be constructed to adequately meet peak flows.

6. MISCELLANEOUS FACILITIES

6.1 Clearing and Construction

1. Development of a site for facilities such as millsites, permanent campsites, gravel pits, fuel storage areas or waste disposal sites requires the authority of a land use disposition.
2. Clearing and brush disposal shall be completed in accordance with the Forest and Prairie Protection Act and Regulations thereto.
3. The timber operator shall salvage all merchantable timber felled in the process of clearing activities.
4. During construction, the timber operator will remove and pile strippings in such a manner that they can be distributed evenly over the disturbed area after construction has been completed.
5. The timber operator shall construct a fire guard around a facility site, where directed by a Forest Officer.
6. Protection of a site and its facilities from an advancing wild fire is the responsibility of the timber operator. All necessary precautions shall be taken to mitigate the risk of an advancing wild fire.

6.2 Gravel Pits

1. The timber operator will periodically review the location and number of gravel pits and reclaim gravel pits which are no longer required.
2. The timber operator shall minimize the number of borrow pits and gravel pits required for road construction and maintenance.
3. Removal of sand and gravel from within the highwater mark of a watercourse is prohibited.

6.3 Campsites

1. Campsites shall be located no less than:
   (a) 300 m from the highwater mark of any permanent watercourse;
   (b) 300 m from or out of sight of a numbered highway, whichever is greater;
   (c) 100 m from a public secondary road; or
   (d) one km from identified mineral licks and other identified key wildlife areas.
2. The location and construction of a temporary campsite within a timber disposition shall be approved in writing by a Forest Officer prior to clearing.

6.4 Refuse and Waste Disposal

1. Campsites and equipment maintenance sites shall be maintained in a neat and clean condition.
2. All combustible refuse and garbage shall be progressively burned in an incinerator when safe or otherwise disposed of at an approved site.

Waste petroleum products shall be collected and disposed of at an approved site as per the Dept. of Environment, Standards and Air Quality regulations.

3. All waste disposal pits shall be constructed in impermeable soils and shall be progressively back filled by sufficient depth of compacted soil as the pit is used or upon abandonment.
4. All sumps containing effluent from a kitchen or washroom facility shall be properly treated on a daily basis.
5. Sewage disposal shall be conducted in accordance with the Public Health Act.

6.5 Fuel and Chemical Storage

1. Temporary storage of petroleum and chemical products shall be located a minimum of 100 m from any watercourse.
2. Permanent petroleum and chemical product storage facilities shall be located a minimum of 300 m from any watercourse. A compacted berm of sufficient height to contain the contents of any fuel tank shall be constructed around the perimeter of the tanks.

6.6 Sawmill Sites

1. Millsites shall be located no less than:
   (a) 300 m from the highwater mark of any permanent watercourse;
   (b) 300 m from or out of sight of a numbered highway whichever is greater;
   (c) 100 m from a public secondary road; or

(d) one km from identified mineral licks and other identified key wildlife areas.

2. The sawdust produced in the course of mill operations shall be disposed of in accordance with the Forest and Prairie Protection Regulations, Part II.

7. ROAD AND FACILITY TENURE, MAINTENANCE, ABANDONMENT AND RECLAMATION

7.1 Tenure and Maintenance of Roads and Facilities

1. All roads and facilities intended to remain open shall be adequately maintained.
2. The Company shall submit a tenure and maintenance plan for roads and facilities as part of the Annual Operating Plan submission. This includes temporary, seasonal and all weather roads that are to be kept open.
3. All weather roads shall be properly surfaced to reduce rutting and minimize watercourse sedimentation during adverse weather.
4. Seasonal and temporary roads may require interim remedial erosion control measures to prevent road degradation and erosion when not in use.
5. Prompt action shall be taken to restore failed revegetation or erosion control measures to stabilize soils.
6. Failed stream crossings shall be removed and replaced by adequately improved crossing structures as soon as possible.
7. Stream crossings shall be kept free of accumulated debris including that from beaver activity to avoid obstruction and washing out.

8. Culverts plugged with ice shall be re-opened before spring break-up.
9. Permanent roads may be temporarily closed to highway vehicles during specific periods of the year, at the request of the operator and at the discretion of the Forest Superintendent. This is to prevent road grade degradation and watercourse sedimentation during adverse weather.

7.2 Road and Facility Abandonment and Reclamation

1. The objective in reclaiming disturbed surfaces upon abandonment is to:
   (a) return the site to the original or acceptable land form;
   (b) restore the original drainage pattern;
   (c) restore or improve the original level of productivity; and
   (d) re-establish a self-sustaining cover of vegetation consistent with that of the surrounding area to stabilize the disturbed soil and minimize erosion.
2. A schedule for abandonment and reclamation of roads and miscellaneous facilities shall be included in the Annual Operating Plan.
3. Reclamation procedures shall be in accordance with guidelines provided in The Resource Handbook, ENR Technical Report No. 75, and standards provided in the Resource Road Planning Guidelines, ENR Technical Report No. T/25.

   A summary of The Resource Handbook is presented as it applies to timber harvesting.
4. Skid trails, landings and roads that are not required to access second cuts such as internal cutblock spur roads and other disturbed surfaces shall be permanently put to bed when no longer required by:

(a) scarifying and leveling to an acceptable land form (in areas of high visual sensitivity the timber operator may be required to recontour roads to the original land form);

(b) removing all watercourse crossing and drainage structures and backsloping approaches to an acceptable slope;

(c) cross ditching to disperse run-off and suspended sediment into undisturbed areas;

(d) rolling back top soil strippings and revegetating bared surface areas to stabilize soils and restore site productivity; and

(e) reforesting disturbed surfaces inside cutovers.

5. Roads required to access second cuts shall be temporarily put to bed when not in use unless otherwise directed, by:

(a) removing all watercourse crossing and drainage structures and backsloping approaches to an acceptable slope, unless otherwise approved in the Annual Operating Plan;

Watercourse crossings approved for retention shall be monitored, listed in operating plan submissions and adequately maintained.

(b) cross-ditching to disperse runoff and suspended sediments into undisturbed areas.

6. Roads being put to bed may be reclaimed in a manner that only allows intermittent trail access for follow-up reforestation work or other public uses.

GLOSSARY

Access Road - any road connecting more than one cutblock.

Contingency Wood - area of accessible wood which would be available for emergency supply at any time of the year.

Cutblock - basic cutting area of merchantable timber designated for removal in one cutting operation.

Cut Plan Area - division of the operations having well defined boundaries established for the purpose of controlling operations during implementation of the operating plan that will sustain operations for a period of three to five years. This could be a sub-watershed or a group of sub-watersheds.

Deferred Cut - area of timber in a current cycle designated for future harvest operations in the management plan.

First Cut - timber that will be cut during the initial harvest operation of the cutting cycle.

Harvest Sequence - order that cut plan areas will be harvested.

Key Wildlife Area - interest area for referral to Fish and Wildlife Division.

Permanent Reserve - area of timber exempted from harvest.

Residual - standing live unmerchantable coniferous or deciduous trees left on a cutblock after harvesting.

Rotation - planned number of years between the formation of a stand and its final cutting at a specific stage of maturity. This includes a regeneration establishment period.

Second Cut - timber designated for removal which will be cut during the second harvest operation of the cutting cycle.

Soil Damage - degree of disturbance to soil that has resulted in a loss of site productivity.

Stream Channel - area of a watercourse to the height of annual peak flows.

Strippings - layers of topsoil and fine debris above mineral soil.

Sub-Watershed - an area drained by a permanent stream, which is part of a larger watershed.

Visual Sensitivity - vulnerability of a forest landscape to visual impacts based on the combination of physical quality, viewing opportunity and viewer characteristics.

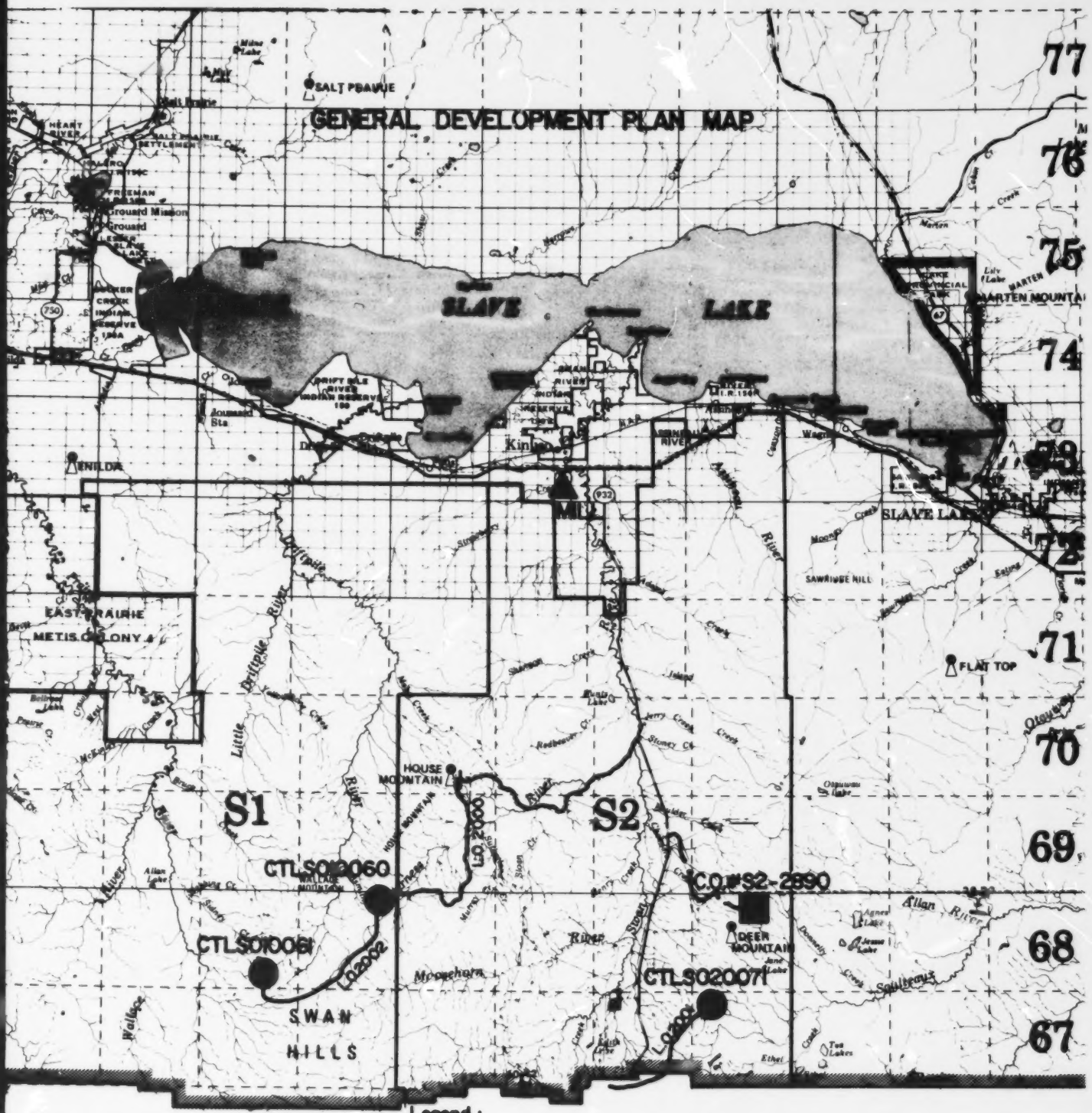
Watercourse - bed and bank of a river, stream, or creek, the shore of a lake, lagoon, swamp, marsh or other natural body of water, whether it contains or conveys water continuously or intermittently and to be inclusive to the normal high water mark.

Watershed Sensitivity - function of the combined effects of water value, stream bed stability and hydraulic characteristics such as water quality, quantity, and timing which may ultimately have an effect on fishery value and downstream value.

Water Source Area - that portion of a watershed between the valley breaks of a permanent, intermittent or ephemeral watercourse where soils are water saturated and/or surface flow occurs and contributes directly to stream flow.

APPENDIX I

GENERAL DEVELOPMENT PLAN AND ANNUAL OPERATING PLAN REQUIREMENTS


GENERAL DEVELOPMENT PLAN MAP
SALT PRAIRIE
SLAVE LAKE
KINUSO
ENILDA
EAST PRAIRIE METIS COLONY
SAWRIDGE HILL
FLAT TOP
HOUSE MOUNTAIN
S1
S2
CTLS010060
CTLS010061
C.O.#S2-2890
DEER MOUNTAIN
CTLS020071
SWAN HILLS
Little Buffalo River
Loop 1
Loop 2
Loop 3
Loop 4
Legend :
Existing Licences
Proposed Licence
Mill Location
Proposed Main Roads
Existing Main Roads
Scale 1:500 000
77
76
75
74
73
72
71
70
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68
67
15 14 13 12 11 10 9 8 7 6 5

TABLE 4

1987 - 1992 General Development Plan

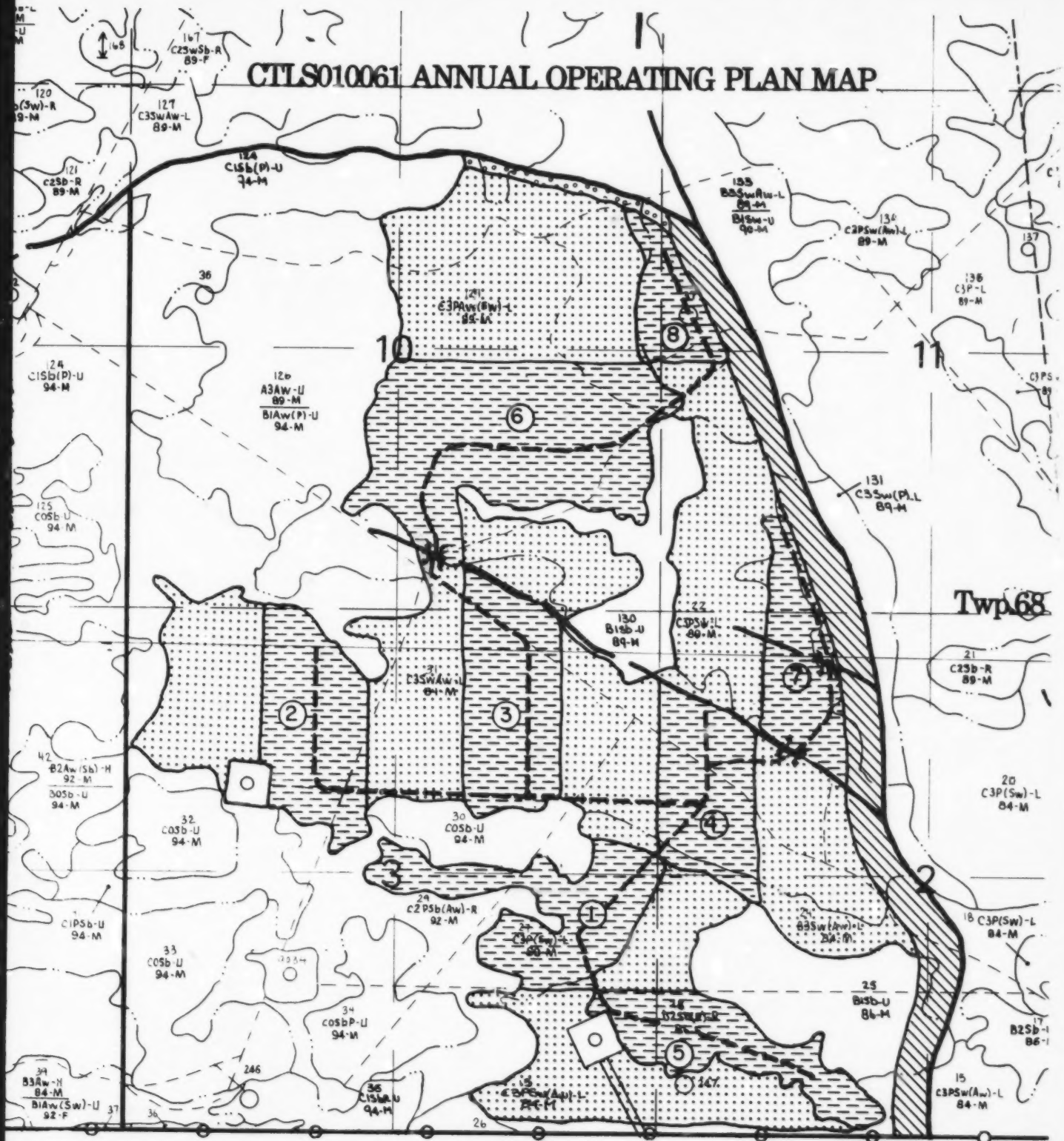
Quota	Quadrant Period	Quadrant Allowable Cut (m^3)	Remaining Volumes(m^3)	Disposition	Estimated Remaining Disposition Volume(m^3)	Proposed Production Schedule					
						1987-88	1988-89	1989-90	1990-91	1991-92	Total
CTQS010060	1986-05-01-1991-04-30	180,000	150,000	CTLS010060	70,000	25,000	25,000		20,000		70,000
				CTLS010061	140,000	20,000	20,000	20,000	20,000	25,000	105,000
CTQS020070	1986-05-01-1991-04-30	120,000	100,000	CTLS020071	100,000	20,000	20,000	20,000	20,000	20,000	100,000
				C.O.#S22890	120,000				20,000	25,000	45,000
Total						65,000	65,000	40,000	80,000	70,000	320,000

TABLE 5

Road Planning and Construction Schedule

Road	Class	Plan Submission Dates Phase I	Phase II	Construction
Access Road to C.O.#S2-2890	III	Summer 87	Summer 88	Summer 89

CTLS010061 ANNUAL OPERATING PLAN MAP

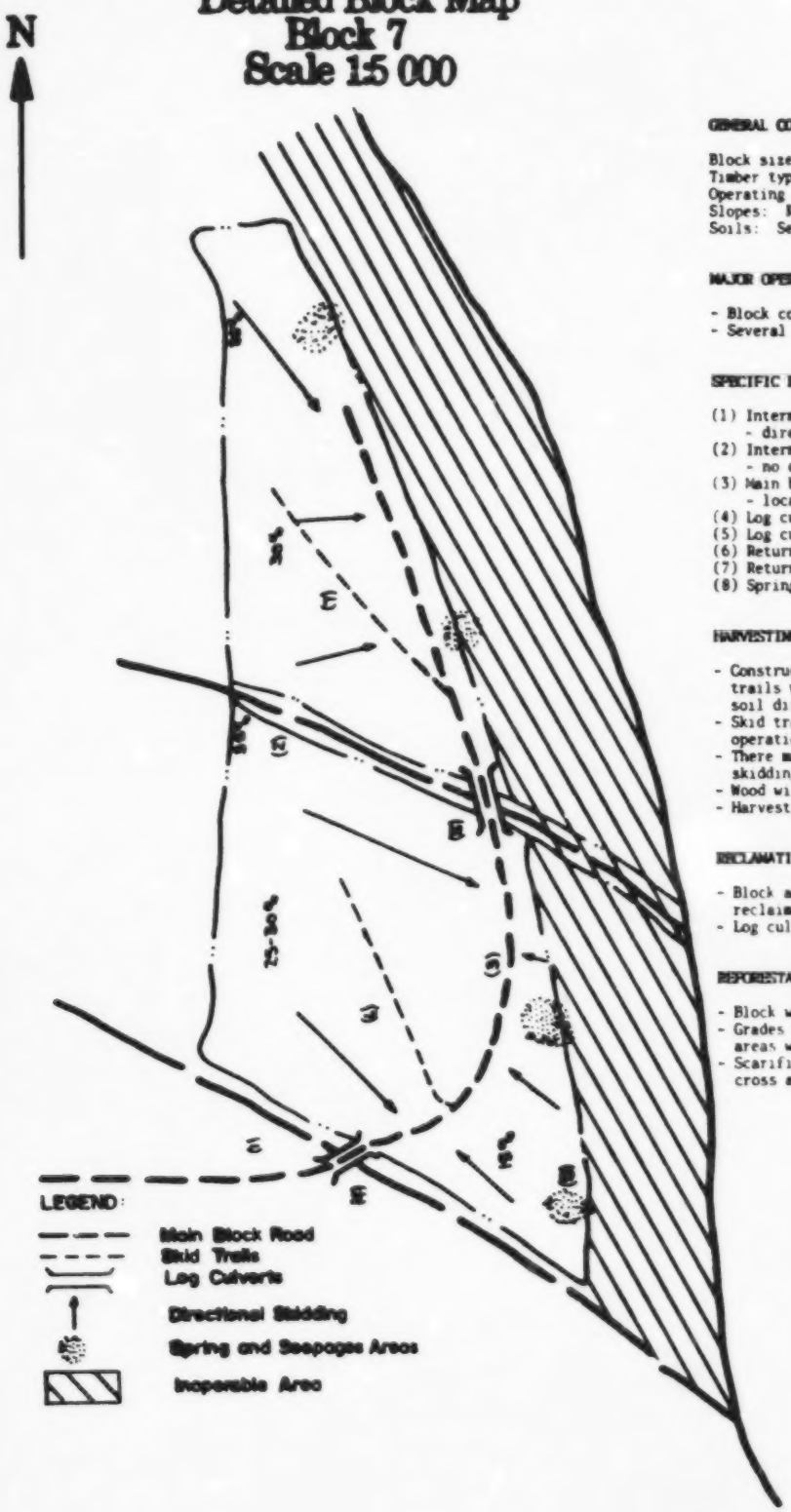


LEGEND:

Cut Blocks	Inoperable Areas
Second Cuts	Existing Roads
Unmerchantable Areas	Proposed Roads
Permanent Reserves	Proposed Crossing

Scale 1:15 000

CTLS010061 Annual Operating Plan
Detailed Block Map
Block 7
Scale 15 000



GENERAL COMMENTS

Block size: 13.2 ha
Timber type: C3 Sw (Aw) - 1
Operating Season: Winter
Slopes: Range from 15-30%
Soils: Sensitive, unstable on the steeper slopes

MAJOR OPERATING CONCERNS

- Block contains sensitive soils which are unstable on the steeper slopes.
- Several spring and seepage areas are located within the block.

SPECIFIC DESCRIPTION

(1) Intermittent stream and 2 m deep incised gully:
  - directional skidding away from gully break.
(2) Intermittent stream and 3-4 m deep incised gully:
  - no cross creek skidding or skidding within the gully
(3) Main block road:
  - located on 15 m wide bench.
(4) Log culvert: 2 X 4 m
(5) Log culvert: 2 X 4 m
(6) Return skid trail at 12%
(7) Return skid trail at 15%
(8) Spring and seepage areas

HARVESTING PLAN

- Construction of the block access road, main interior block road and skid trails will occur when the ground is frozen and snow covered to minimize soil disturbance.
- Skid trails will be marked in the field prior to the commencement of operations.
- There may be spring and seepage areas that will be unfrozen and affect skidding.
- Wood will be decked at road side.
- Harvesting and hauling will be completed within one operating season.

RECLAMATION PLAN

- Block access road, main interior block road and skid trails will be reclaimed prior to breakup.
- Log culverts will be retained until reforestation treatment is completed.

REFORESTATION PLAN

- Block will be bracke scarified and planted the summer following harvesting.
- Grades which can't be negotiated by the equipment and spring and seepage areas will be hand scalped and planted.
- Scarification equipment will be kept out of the gullies and will only cross at the log culverts.

TABLE 6

ROAD MAINTENANCE AND ABANDONMENT PLAN
1987-88 OPERATING YEAR

Road	Class	Tenure	Status of Use	Maintenance and Abandonment			
				Activity	Status of Activity	Schedule for Completion	Results and follow up
L.O. 2000	III	1992	Active	1. Culvert repair and maintenance between km 1-10.	Completed Summer 86		Satisfactory Monitoring required.
				2. Stabilization and seeding of embankments of Murray Ck crossing.	Completed Summer 86		Unsatisfactory Re-seeding Summer '87.
				3. Stabilization of slumping embankments of Inverness Ck crossing by stabilization and seeding.	Proposed	Summer 87	
				4. Culvert maintenance and repair.	Proposed	Summer 87	
				5. Seeding of embankments of Murray Ck crossing.	Proposed	Summer 87	
CTLS010060 Main Haul Road	III	1992	Active	1. Stabilization of fills between km 1 and 2.	Completed Summer 86		Satisfactory Monitor
				2. Culvert repair between km 1 and 2.	Completed Summer 86		Satisfactory Monitor
CTLS010060 Access Road	IV	1987		1. Removal of Goldsmith Ck Crossing.	Proposed	Fall 87	Satisfactory
				2. Removal of all watercourse crossings and culverts.	Proposed	Fall 87	
				3. Complete reclamation and revegetation.	Proposed	Summer 87	
L.O. 2001	III	1992	Active	1. Regular maintenance activities.	Proposed	Ongoing during the year	

APPENDIX II

Detailed Cutblock Planning

Criteria for determining blocks for which a detailed plan has to be developed could include:

- blocks located in areas of broken topography with unstable and erodible soils,
- blocks with sustained slopes greater than 30 per cent,
- blocks with high drainage densities,
- blocks containing protective buffer areas for harvesting, and
- blocks located in key aesthetic, wildlife and watershed areas.

Detailed cutblock plans may include any or all of the following:

(i) sketch maps (scale 1:5000 to 1:15000 as necessary) showing:

- location of roads, landings and main skid trails,
- direction of skidding
- location of streams and their classification,
- location and type of watercourse crossings (size should be indicated if culverts are to be used),
- terrain features which may have impact on the operation including: springs, seepages, water source areas, steep slopes and erodible soils, and
- factors such as protective buffers for watercourses and key wildlife and aesthetic values which may impact on the operation.

(ii) brief management prescription which includes one or any of:

- stand and site description,
- explanation of resource concerns, and
- harvesting, reforestation and reclamation prescriptions and time lines.

LIST OF REFERENCES

Alberta. Energy and Natural Resources. Alberta Forest Service, Forest Land Use Branch. 1982. Resource Road Planning Guidelines for the Green Area of Alberta. Edmonton. ENR No. T/25.

Alberta. Energy and Natural Resources. Alberta Forest Service. 1985. Stream Crossing Guidelines, Operational Guidelines for Industry. Edmonton. ENR No. T/80.

Alberta. Energy and Natural Resources. Alberta Forest Service. Forest Land Use Branch, Watershed Management Section. 1984. "Sizing Crossings for Eastern Slope Streams, A Review of Some Common Methods". Edmonton.

Alberta. Energy and Natural Resources. Alberta Forest Service. Timber Management Branch, Timber Harvest Cutblock Design. Edmonton. (Previously ENR Report No. 43, 2nd Printing, Edmonton, 1976), ENR No. T/16. Reprinted 1981.

Alberta. Energy and Natural Resources. 1984. A Policy for Resource Management of the Eastern Slopes, Revised 1984. Edmonton. ENR No. T/38.

Alberta. Energy and Natural Resources. 1976. The Logging Slash Hazard Evaluation and Prescribed Burning Manual. Edmonton.

Alberta. Forestry, Lands and Wildlife. Alberta Forest Service. Forest Landscape Management Guidelines for Alberta. 1986. Edmonton.